

## **Letter of Transmittal**

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Dear Ms. McHugh,

We are writing to you seeking your approval of our how-to guide proposal. This how-to guide is a technical instructions document for how-to setup a Raspberry Pi for web development. This guide introduces the Raspberry Pi for web developers who are looking to learn to program on a Linux operating system. The purpose of this guide is to configure the Raspberry Pi OS so that the aspiring developer can begin learning about the operating system and about developing for the web.

Before detailing the steps in the how-to guide, we'd like to provide some background information on the Raspberry Pi in case you're unfamiliar with this powerful minicomputer. When first beginning to learn about computers, it's not easy for everyone. And so, the first generation Raspberry Pi was developed to make computer learning easy and engaging for school students. A key to ensuring the success of the Pi's mission was developing a great operating system to be run on such a small-sized computer. The Raspberry Pi OS is the foundation's official supported operating system. It comes pre-installed with many software applications for education, programming, and other simple uses. It has Python, Scratch, Sonic Pi, Java, and many more. The Raspberry Pi is just like any other computer. It has a CPU, GPU, USB ports, and i/o pins and each Pi has features like WiFi and Bluetooth allowing it to maintain a connection without the involvement of any physical connection. It can also be connected to a TV or any computer monitor via it's HDMI port.

Detailed below is a set of main steps that we plan to address in this how-to guide.

- An introduction about what the Raspberry Pi is.

- The necessary hardware and software needed to start working with Raspberry Pi.
- How to add an operating system to the Raspberry Pi.
- How to set up a Raspberry Pi for web development.
- How to update and upgrade the Raspberry Pi.
- How to add programs to the Raspberry Pi.
- How to start coding on Raspberry Pi.

There will be a few necessary materials/items for this how-to guide. The user will be required to have a Raspberry Pi (with included cords for power, display, and ethernet), an external monitor (HDMI compatible), an external keyboard (USB type B), an external mouse (USB type B), a microSD card, a microSD card reader, and a functioning computer with an internet connection to download the Raspberry Pi OS.

This how-to guide is intended for any beginner web developer looking to learn more about the Linux operating system and web development. It is a necessary how-to guide for this demographic as the guide will show them how to properly set up their Raspberry Pi to begin programming for the web. By the end of this guide, the user will be ready to begin learning and using the Raspberry Pi OS (a Linux operating system), and will also be ready to begin learning and practicing web development, as their Raspberry Pi will be properly configured and set up.

In summary, the value provided by this how-to guide is truly priceless. This guide will give a beginner web developer the ability to correctly setup their Raspberry Pi, which will enable them to begin learning more about how the Linux operating system works and to also begin learning more about web development. With the help of this how-to guide, the user will be able to get up and running with learning about important technologies that will help shape the future. And so, we would very much appreciate the approval of our proposed how-to guide. With your approval, we will be able to reach these aspiring web developers at a crucial stage in their learning journey and help them correctly setup their learning and development environment (computer). From there, who knows how far these web developers will go and what future they will build. Your approval of this how-to guide will make all of this and more possible.

Sincerely,  
Saba Rokni, Ahmad Alamer & Aidan Aylward

# **Instructions for how to Setup a Raspberry Pi for Web Development**

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Internet Applications & Web Development

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## **Required Parts**

### **Section A: Hardware**

| <b>Component / Part</b>                                                  | <b>Purpose</b>                                                                                                                                              |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Raspberry Pi                                                             | To set up your development environment on.                                                                                                                  |
| USB-C Power Supply<br>(Provided with Pi)                                 | To supply power to your Pi.                                                                                                                                 |
| Micro USB-C to HDMI Cord<br>(Provided with Pi)                           | For connecting the Pi to a monitor to view the GUI.                                                                                                         |
| Ethernet Cable (if<br>necessary)                                         | For connecting your Pi to the internet via ethernet. Only<br>necessary if not planning on using wifi..                                                      |
| Monitor (HDMI Compatible)                                                | For displaying the Pi's desktop screen (GUI).                                                                                                               |
| Mouse (USB-B)                                                            | For clicking and interacting with the Pi's GUI.                                                                                                             |
| Keyboard (USB-B)                                                         | For typing and interacting with the Pi.                                                                                                                     |
| MicroSD Card (16gb min.)                                                 | For holding your Pi's operating system and storage.                                                                                                         |
| MicroSD Card reader/cable<br>(if necessary)                              | For being able to transfer data from your computer to<br>the microSD card. Only necessary if your computer<br>does not have a microSD card slot/port on it. |
| Personal Computer with<br>Internet running either<br>macOS or Windows OS | For being able to download Raspberry Pi OS and flash<br>it to the microSD card.                                                                             |

### **Section B: Software**

| <b>Program</b>                                        | <b>Purpose</b>                                                                                                                                      |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Raspberry Pi OS                                       | Operating system for the Raspberry Pi. (Instructions<br>will outline how to download this program)                                                  |
| 7Zip (Windows) / Unarchiver<br>(macOS) (If necessary) | Programs for unzipping downloaded files. Only<br>necessary if your personal computer's operating<br>system is unable to unzip the downloaded files. |

|              |                                                                                                                                                                                                                                                                           |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| balenaEtcher | Program for flashing disk images (.img files) to a microSD. More details about balenaEtcher are given in the glossary. (Instructions will outline how to download this program)                                                                                           |
| VNC Viewer   | Program that enables you to connect to your Pi and view it's desktop without needing to use an external monitor. With the Pi powered on and connected to the internet you can connect to it via it's IP address. (Instructions will outline how to download this program) |
| Putty        | Program for Windows OS to be able to connect with the Pi remotely through SSH. MacOS users have this ability natively in their default terminal application. (Instructions will outline how to download this program)                                                     |
| Node.js      | Software for developing javascript applications. More details about Node.js are outlined in the glossary. (Instructions will outline how to download this software)                                                                                                       |

## **Introduction**

The Raspberry Pi Foundation is a charity based in the UK that works to empower people all over the world with computing and digital making skills [1]. The Foundation achieves this by creating computer science related resources available to the world on their website ([raspberrypi.org](https://raspberrypi.org)) and brings their content into practice via their affordable, high-performance computers with a suite of open-source software. In addition to this, the Foundation has created a thriving network of clubs and events for learners to engage in, partnerships with youth organizations to achieve an even broader impact, and curriculums and training for teachers looking to provide their students with the best possible computer studies. Our focus with this how-to guide will be on the Raspberry Pi 4 Model B, (one of the Raspberry Pi Foundation's computers) and how to properly configure it to allow the user to begin exploring all that the Foundation has to offer.

The purpose of this document is to instruct aspiring web developers on how to set up a Raspberry Pi for web development. This how-to guide will go through step by step how to take an unconfigured Raspberry Pi and properly configure it for web development specifically. This configuration will allow the user to go on and explore the vast world of web development with their Pi. Our hope with this guide is for it to be a helpful resource and the first step for aspiring web developers. This guide will be using a Raspberry Pi 4 Model B to perform the guide, but any Raspberry Pi generation or model will apply for this guide, except for the Raspberry Pi Zero models. Please note throughout the guide we will be interchangeably referring to the Raspberry Pi 4 as Raspberry Pi 4, Raspberry Pi, RPi, or simply Pi. Also, this guide assumes you have access to a computer or laptop with either a Mac or Windows operating system.

# Instructions

## Section A: Download the Raspberry Pi OS and Other Helpful Softwares To Personal Computer / Laptop

1) Gather all required hardware parts for this section.

1.1. Mandatory parts include:

- A microSD card.
- A personal computer/laptop running either macOS or Windows OS, with an internet connection.

1.2. Optional / If necessary parts include:

- A microSD card reader compatible with your personal computer/laptop.
- An external mouse and/or keyboard if necessary to use your computer/laptop.

**NOTE:** “Personal computer/laptop” will be referred to as “computer” for the remainder of the document.

2) Download the Raspberry Pi OS.

2.1. Turn on the computer, open a web browser, and navigate to this URL:  
<https://www.raspberrypi.org/software/operating-systems/>.

2.2. Locate the download option titled “Raspberry Pi OS with desktop and recommended software”, and click the “Download” button.

**Note:** This will download the Raspberry Pi OS as a zip file.

**TIP:** See Fig. 1.0. below for more details. In the red circle is the correct download button.

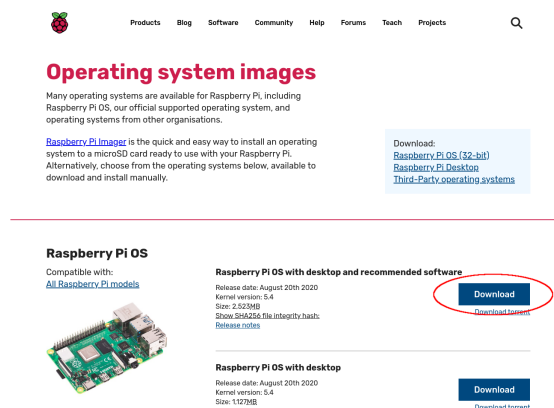


Fig. 1.0. [2]



2.3. Navigate to your computer's downloads folder and unzip the downloaded file.

2.3.a. Use the application 7Zip (available at <https://www.7-zip.org/download.html>), if unable to unzip the file on Windows OS.

2.3.b. Use the application Unarchiver (available at <https://theunarchiver.com/>), if unable to unzip on macOS.

**TIP:** *Unzip the file in the same directory (downloads folder) so you can easily remember it for upcoming steps.*

3) Download and install the balenaEtcher application on your computer.

3.1. Open another web browser tab/window and navigate to this URL: <https://www.balena.io/etcher/>.

3.2. Click the download button to download the balenaEtcher application for your computer's operating system.

3.3. Navigate to your computer's downloads folder and click on the downloaded file, after the correct file has been downloaded. This will prompt the installer to run. Go through each step of the installer until the application has been successfully installed.

**TIP:** *If the website doesn't automatically suggest the correct download file, you must select the correct file. If on Windows OS, select "Etcher for Windows (x86|x64) (Installer)". If on macOS, select "Etcher for macOS". Also, see Fig. 2.0. circled in red is the correct button to click to download the application, and the toggle arrow on the right side of the button is for selecting the correct download file for your operating system if the correct download is not suggested.*

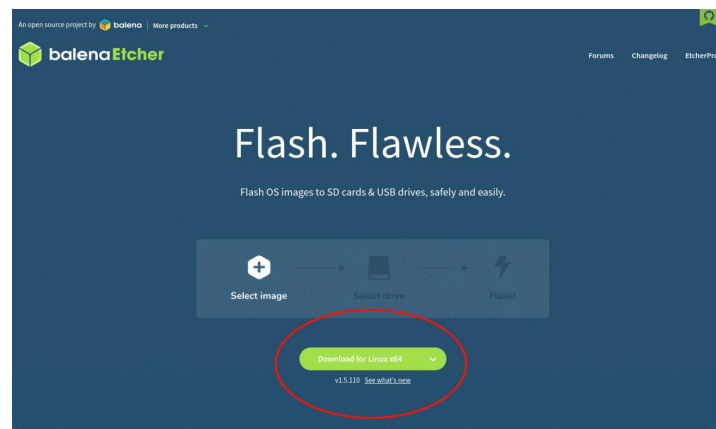


Fig. 2.0. [3]

#### 4) Flash the image to the microSD card.

4.1. Insert the microSD card into your computer (use the microSD reader if necessary).

**TIP:** Ensure your microSD card has been found by navigating to your File Explorer application (Windows OS)/Finder application (macOS) and identifying your microSD card in the left-side menu.

4.2. Navigate to your computer's applications directory and open balenaEtcher.

4.3. Click the "select image" button/option, navigate through your computer's file system to where you unzipped the Raspberry Pi OS image (.img file), and select that file.

4.4. Click the "select drive" button/option, then select your microSD card.

4.5. Click the "flash" button/option to write the Raspberry Pi OS image to your microSD card.

4.6. Wait until the progress bar completes. Eject your microSD card, once complete.

#### 5) Download Other Helpful Softwares To Your Computer

**Note:** Window OS users must complete both instructions 5.1. and 5.2. MacOS users only need to complete instructions 5.1.

##### 5.1. Download and install VNC Viewer

5.1.1. Open another web browser tab/window and navigate to this URL:  
<https://www.realvnc.com/en/connect/download/viewer/>.

**Note:** VNC Viewer is a VNC client application for your computer to access your Pi's desktop remotely.

5.1.2. Click on the correct download link for your computer.

**Note:** The website should automatically select the correct download file for your operating system. In the event, it did not automatically select the correct operating and download file, manually select the correct operating system from the list and the corresponding download file.

**TIP:** See Fig. 3.0. below for more details. Highlighted in the red rectangle is the button to click to initiate the download. For Windows OS users,

*highlighted in the green circle is a dropdown list option to ensure you've selected the correct download for your system. For most modern systems "EXE x86/x64" will be the correct option.*

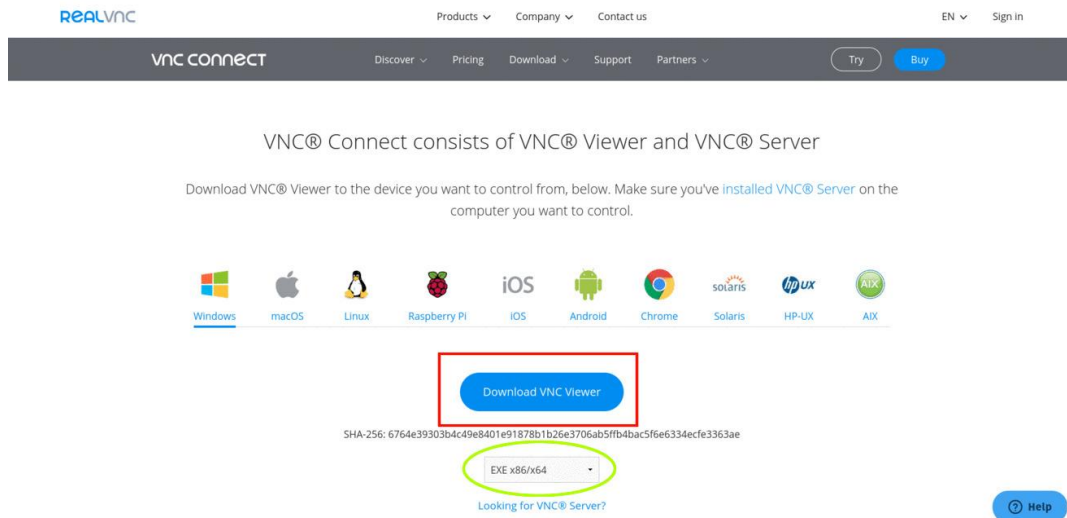


Fig. 3.0. [4]

5.1.3. Navigate through to your computer's downloads folder and click the downloaded file, after it downloads. This will run the installer. Click "next" through the installer to properly install the program.

## 5.2. Download and install Putty (For Windows OS users only)

5.2.1. For Windows OS users, open another web browser tab/window and navigate to this URL:

<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>.

**Note:** Putty is an SSH client application for your computer to access your Pi's terminal remotely.

5.2.2. Click on the correct download link for your computer.

**Note:** Most modern computers are 64bit architecture.

**TIP:** See Fig. 4.0. below for more details. Highlighted in the red rectangle are the two possible download links for Windows OS.

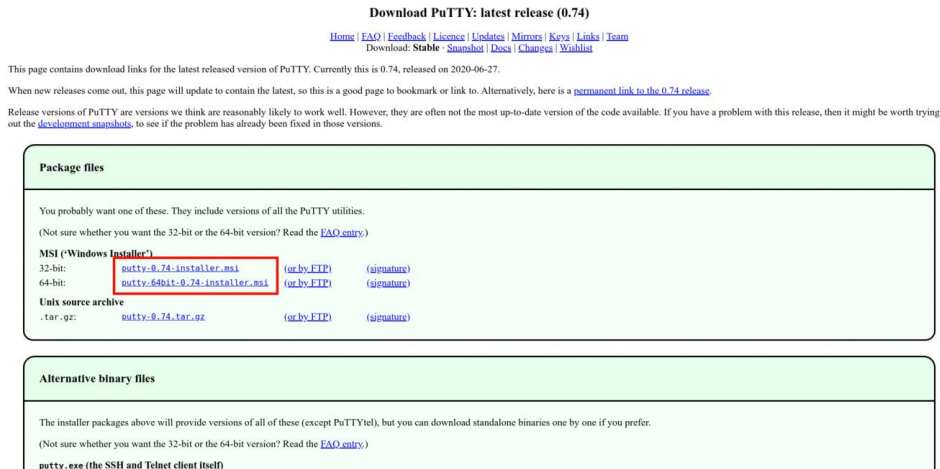


Fig. 4.0. [5]

5.2.3. Navigate through to your computer's downloads folder and click the downloaded file, after it downloads. This will run the installer. Click 'next' through the installer to properly install the program.

## Section B: Setup & Configure the Raspberry Pi

1) Gather all required parts, lay them out on a table in front of you, and identify all parts.

1.1. Open the Raspberry Pi box and layout each of its parts.

1.2. Identify each of the Pi's parts:

1.2.1. Identify the micro USB power supply cable.

1.2.2. Identify the micro USB to HDMI cable.

1.2.3. Identify the ethernet cable (if not planning on connecting to your LAN via wifi).

1.3 Gather and identify the externals:

1.3.1. Identify the external USB (type B) mouse.

1.3.2. Identify the external USB (type B) keyboard.

1.3.3. Identify the external HDMI compatible monitor.

1.3.4. Identify the external microSD card prepared in the first section.

**TIP:** Separate the Raspberry Pi's parts from the externals, this will help you keep a cleaner workspace and move more smoothly through the guide.

2) Analyze Fig 5.0. and understand where each area is located on your RPI.

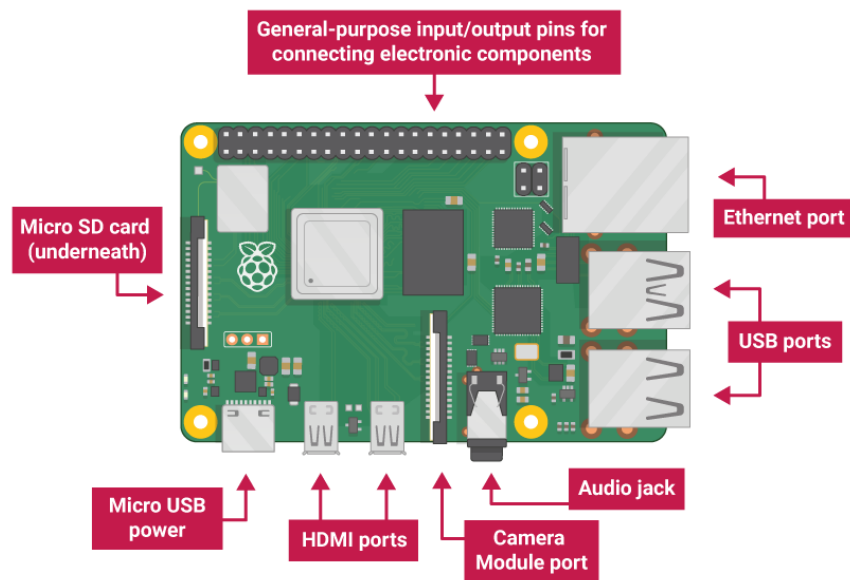


Fig 5.0. [6]

**TIP:** The most important parts to identify are the Micro USB Power Port, HDMI Ports, USB Ports, and Ethernet Port.

3) Setup your Raspberry Pi's hardware to boot the new OS

3.1. On a desk, or similar, insert the following externals/cables into your Raspberry Pi:

3.1.1. Insert your external mouse into one of the Pi's USB ports.

3.1.2. Insert your external keyboard into the Pi's open USB port.

3.1.3. Insert the HDMI cable's micro USB end into the Pi's micro USB HDMI port number zero.

**Note:** Port zero is located closest to the micro USB power port, see Fig. 5.0 for a visual example.

3.1.4. Insert the microSD card (prepared in section A) into the Raspberry Pi's microSD card slot.

3.2. Place your external monitor on the desk/surface and plug it into a nearby outlet, then turn it on.

3.3. Insert the HDMI end of the HDMI cable into your external HDMI compatible monitor.

4) Boot your Raspberry Pi with the new OS.

4.1. Plug the power supply cable into a nearby outlet, and connect the cable's micro USB end into the Pi's corresponding micro USB slot.

4.2. Wait for the Pi to boot up, then move on to step 5.

5) Setup the Raspberry Pi's software.

5.1. Press "Next" when prompted with the welcome dialog, then select your country, language, and timezone from their respective dropdown lists. Next, select whether to use the English language, and whether or not to use the US keyboard via their respective checkboxes. Press "Next" when satisfied with selections.

5.2. Enter a new password and confirm your password when prompted. Press "Next" when satisfied with your password.

**TIP:** Write your password down somewhere safe so you can remember it better and retrieve it if ever lost.

5.3. Check "this screen shows a black border around the desktop" when prompted, then press "Next".

**Note:** This option, when checked, ensures that once rebooted the Pi will then take up the full-screen size available on the monitor.

5.4. Setup network connection.

5.4.a. Select your wifi network, and press "Next" when prompted, if using a wifi network connection. Enter your wifi's password, on the next screen when prompted. Press 'Next' when satisfied.

**TIP:** If you're unable to select or connect to your wifi network, or you've forgotten your network's password, click "Skip" to skip this step. This can be set up later.

5.4.b. Alternatively, plug the ethernet cable into the Pi's ethernet port and your router's ethernet port, then click skip to skip the wifi setup section, if using an ethernet network connection.

**TIP:** You'll know your ethernet is successfully connected when you see the blue symbol in the upper right-hand corner of your monitor go from grey with red x's to blue.

#### 5.5. Update software.

5.5.a. Press "Next" to update the operating system's software if your Pi is connected to the internet.

**TIP:** It is recommended to keep your operating system's software as up to date as possible. There are many reasons including security, performance, and bug fixes that are addressed with each update, hence why it's important to keep your OS up to date. Most Linux users run updates every time they boot up their computers.

5.5.b. Press "Skip" if your Pi is not connected to the internet.

5.6. Press "Restart", when prompted, to have your setup changes take place. Wait for your Pi to restart.

**Note:** Congrats, your setup is now complete! Next, we move on to configuring the Raspberry Pi's OS.

#### 6) Configure the Raspberry Pi's OS.

**Note:** In this section, we will be configuring the Raspberry Pi OS to access the computer remotely. This means that you can interact in two different ways. The first way is via VNC which allows you to view the desktop screen. The second way is via SSH which allows you to interact with the computer's terminal. The following instructions will be performed using the command line.

6.1. Press "ctrl" + "alt" + "t" on your keyboard to open your Pi's terminal.

**Note:** Alternatively, you can navigate to the top bar menu and click on the "Terminal" icon.

6.2. Type "sudo raspi-config" into the opened terminal.

**Note:** This command will open the Raspberry Pi's configuration options.

**TIP:** When using the "sudo" command you will oftentimes be asked to enter your password, enter the password you set up for your user in step 5.2.

6.3. Enable SSH

6.3.1. Press the arrow keys on your keyboard to navigate the new screen. Press on the down arrow key to navigate to option number 5 - "Interfacing Options". Press 'enter' to select this option.

Note: Press the enter key to select an option when it is highlighted red.

6.3.2. Press the down arrow key to navigate to option number "P2" - "SSH". Press "enter" to select this option.

6.3.3. Press "enter" on the next screen's "Yes" option to enable an SSH server on your Pi.

6.3.4. Press "enter" on the next screen's "Ok" option to return to the Raspberry Pi's software configuration home screen.

#### 6.4. Enable VNC

6.4.1. Press on the down arrow key to navigate to option number 5 - "Interfacing Options". Press "enter" to select this option.

6.4.2. Press the down arrow key to navigate to option number "P3" - "VNC". Press "enter" to select this option.

6.4.3. Press "enter" on the next screen's "Yes" option to enable a VNC server on your Pi.

6.4.4. Press "enter" on the next screen's "Ok" option to take you back to the Raspberry Pi's software configuration home screen.

6.5. Use the right arrow key to navigate to the "Finish" option. Press "enter" to save your configuration options.

**Note:** *Congratulations, you have successfully enabled SSH and VNC on your Raspberry Pi! You can now access your Pi remotely from the computer you installed the VNC viewer application on (and via putty for Windows OS users).*

## Section C: Update Web Development Software On The Raspberry Pi

### 1) Update Node.js and NPM

1.1. Navigate to your Pi's home screen. Once there, press 'ctrl' + 'alt' + 't' on your keyboard to open your Pi's terminal.

**Note:** *Alternatively, you can navigate to the top bar menu and click on the 'Terminal' icon.*



1.2. Type “node -v” and press enter, with the terminal open.

**Note:** This command is for checking if you have Node.js installed on your system and if installed, what version number. The expected response at this time is “v10.21.0”.

1.3. Type “npm -v” and press enter in an empty command line.

**Note:** This command is for checking if you have NPM installed on your system and if installed, what version number. The expected response at this time is “5.8.0”.

1.4. Type “sudo apt update” and press enter in an empty command line.

**Note:** This command is for updating your system. You always want to run an update before installing any new software to ensure your software is up to date and will successfully install the new software you’re planning to add to the system.

1.5. Type “npm cache clean -f” and press enter in an empty command line.

**Note:** This command will ensure NPM’s cache is clean, and the next install you perform with npm will be from a clean slate.

1.6. Type “sudo npm install -g n” and press enter in an empty command line.

**Note:** This command will globally install a software package called “n”. This package is used for updating and changing the version of Node.js on your system.

1.7. Type “sudo n stable” and press enter in an empty command line.

**Note:** This command uses the “n” software package to update Node.js to the latest stable version. It is recommended to always use the latest stable version of software packages to ensure performance, security, and reliability.

1.8. Click the “x” in the top right-hand corner of the terminal to exit out, and open a new terminal window.

1.9. Type “node -v” and press enter in an empty command line.

**Note:** As previously mentioned, this command will check for the version of Node.js used by the system. The expected response at this time is “v.14.15.1”. Congrats, you’ve successfully updated Node.js to it’s latest version, and you’re ready to take on learning the world of web development!

## Conclusion

Now that you've gone over the required parts, downloaded the necessary software, setup & configured your Raspberry Pi, and updated important web development software on the Pi, you're ready to start learning about web development! The primary skill gained, setting up your development environment, will serve as the foundation for which you build your developer skills and potential career off of. Our hope with this guide is for it to have been a helpful resource and the first step for you, the aspiring web developer. We have included Raspberry Pi maintenance & general tips, and free learning resources for where to get started with the basics of web development. Just choose any of the pre-installed text editors, use one of our recommended resources, and you're well on your way to becoming a web developer!

### Maintenance & General Tips

- When finished using the Raspberry Pi, always shutdown / power off the Pi, then unplug it from the power source.
- Keep your Raspberry Pi in a cool area. The Pi heats up quickly so keeping it cool will ensure it'll perform better for longer.
- Frequently perform the "sudo apt update" and "sudo apt upgrade" commands. A general rule is to do update before every installation of a package and update & upgrade every time you boot the Pi.
- When in doubt, Google it! There's a tremendous amount of resources available online to help you in learning and fixing your Pi if anything were to go wrong.

### Learning Resources

- Codecademy: <https://www.codecademy.com/>. Codecademy is a mostly free interactive platform to learn web development and more.
- Free Code Camp: <https://www.freecodecamp.org/>. Free Code Camp is a free interactive platform, similar to Codecademy, to help you learn web development and more.
- Coursera: <https://www.coursera.org/>. Coursera is a platform with free videos and courses to learn about web development and more.
- W3Schools: <https://www.w3schools.com/>. W3Schools is a website with text-based tutorials that will help you learn about web development and more.
- Traversy Media:  
<https://www.youtube.com/channel/UC29ju8bIPH5as8OGnQzwJyA>. Traversy Media is a youtube development channel that specializes in web development related content to help you learn web development and more.

## Glossary

### Section A: Definitions

| Term                         | Definition                                                                                                                                                                                                                                                                                           |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| balenaEtcher                 | balenaEtcher is a free and open-source utility used for writing image files such as .iso and .img files, as well as zipped folders onto storage media to create live SD cards and USB flash drives.                                                                                                  |
| Boot                         | A boot sequence is the initial set of operations that the computer performs when it is switched on.                                                                                                                                                                                                  |
| Cache                        | A cache is a hardware or software component that stores data so that future requests for that data can be served faster.                                                                                                                                                                             |
| Command Line/Terminal/Shell  | Although these words have different definitions, for the sake of simplicity in this document, they will all be used interchangeably to mean the same thing. What a command line/terminal/shell is, is a way of directly interacting (typing) with the system without using a typical user interface. |
| Flash/Write image to microSD | Flash/Write image to microSD means to put the Operating System into the microSD.                                                                                                                                                                                                                     |
| Folder/Directory             | It is an organizing unit in a computer's file system for storing and locating files.                                                                                                                                                                                                                 |
| GUI                          | A graphical user interface (GUI) is a type of user interface through which users interact with electronic devices via visual indicator representations.                                                                                                                                              |
| Image File                   | A Raspbian image is a file that you can download onto an SD card which can be used to boot your Raspberry Pi and Via APC into the Raspbian operating system. Using a Raspbian image is the easiest way for a new user to get started with Raspbian.                                                  |
| LAN                          | A local area network is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building.                                                                                                                         |
| microSD                      | Secure Digital, officially abbreviated as SD, is a proprietary non-volatile memory card format developed by the SD Association for use in portable devices.                                                                                                                                          |

|                        |                                                                                                                                                                                                                                                                                                                    |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node.js                | Node.js brings event-driven programming to web servers, enabling development of fast web servers in JavaScript.                                                                                                                                                                                                    |
| NPM                    | NPM, short for Node Package Manager, is two things: first and foremost, it is an online repository for the publishing of open-source Node.js projects; second, it is a command-line utility for interacting with said repository that aids in package installation, version management, and dependency management. |
| Operating System (OS)  | An operating system is system software that manages computer hardware, software resources, and provides common services for computer programs.                                                                                                                                                                     |
| Raspberry Pi           | Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom.                                                                                                                                                              |
| Raspberry Pi OS        | An operating system of Raspberry Pi.                                                                                                                                                                                                                                                                               |
| Raspberry Pi 4 Model B | The Raspberry Pi 4 Model B is the latest version of the low-cost Raspberry Pi computer.                                                                                                                                                                                                                            |
| Reboot                 | In computing, rebooting is the process by which a running computer system is restarted.                                                                                                                                                                                                                            |
| SSH                    | SSH or Secure Shell is a cryptographic network protocol for operating network services securely over an unsecured network.                                                                                                                                                                                         |
| SSH Client             | An SSH client is a software which uses the SSH protocol to connect to a remote computer.                                                                                                                                                                                                                           |
| SSH Server             | SSH is a protocol for securely exchanging data between two computers over an untrusted network. SSH protects the privacy and integrity of the transferred identities, data, and files. It runs in most computers and in practically every server.                                                                  |
| Stable Version         | A stable release is a version that has been tested as thoroughly as possible and is as reliable as we can make it.                                                                                                                                                                                                 |
| Text Editor            | A program used to write into files. Commonly used for editing and writing lines of code in a software file.                                                                                                                                                                                                        |
| URL                    | URL stands for Uniform Resource Locator. A URL is also called a web address. It is a reference to the location and means of retrieving a web resource.                                                                                                                                                             |
| VNC                    | Virtual Network Computing (VNC) is a graphical desktop-sharing                                                                                                                                                                                                                                                     |

|            |                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------|
|            | system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer.        |
| VNC Client | Multiple clients may connect to a VNC server at the same time.                                       |
| VNC Server | VNC Server captures the desktop of the computer in real-time and sends it to VNC Viewer for display. |

## Section B: List of Parts and Diagrams

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## **References**

### **Citations**

[1] "About us", *Raspberry Pi Foundation* [Online]. Available: <https://www.raspberrypi.org/about/>. [Accessed: 31-Oct-2020].

[2] "Raspberry Pi OS (previously called Raspbian)", *Raspberry Pi Foundation* [Online]. Available: <https://www.raspberrypi.org/software/operating-systems/>. [Accessed: 28-Nov-2020].

[3] *Balena* [Online]. Available: <https://www.balena.io/etcher/>. [Accessed: 5-Nov-2020].

[4] *RealVNC* [Online]. Available: <https://www.realvnc.com/en/connect/download/viewer/windows/>. [Accessed: 6-Nov-2020].

[5] *Putty* [Online]. Available: <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>. [Accessed: 6-Nov-2020].

[6] "Getting started with Raspberry Pi", *Raspberry Pi Foundation* [Online]. Available: <https://projects.raspberrypi.org/en/projects/raspberry-pi-getting-started/2>. [Accessed: 1-Nov-2020].